

DIET OF COYOTES AT LEMOORE NAVAL AIR STATION

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ABSTRACT: Fresno kangaroo rats (*Dipodomys nitratooides exilis*) an endangered subspecies of the San Joaquin kangaroo rat, are present at Lemoore Naval Air Station, Fresno and Kings Counties, California. Coyotes (*Canis latrans*) are also present on base and are a potential predator of these kangaroo rats. I collected coyote scats from July 1992 through January 1993 to determine if coyotes at Lemoore feed on Fresno kangaroo rats. Cricetid rodents were the most frequent prey item found in the 93 scats collected. Other prey items occurring in scats included insects, lagomorphs, California voles (*Microtus californicus*), California ground squirrels (*Spermophilus beecheyi*), gophers (*Thomomys* spp.), and birds. Fruit was found in a high percentage of scats collected during July-September. Fresno kangaroo rats were not present in any of the scats collected. It is likely that coyote predation on this species is infrequent at Lemoore Naval Air Station.

Key words: *Canis latrans*, *Dipodomys nitratooides exilis*, diet, prey, San Joaquin Valley.

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The San Joaquin Valley is one of the most productive agricultural centers in the world, with 98% of the Valley's 3.44 million hectares developed for agriculture (Williams and Kliburn 1992). This development has negatively impacted endemic species including the San Joaquin kangaroo rat (*Dipodomys nitratooides*), (Chesemore and Rhodehamel 1992, Williams and Germano 1992).

The San Joaquin kangaroo rat is endemic to the San Joaquin and adjacent valleys of California (Hall 1981). There are currently 3 recognized subspecies: Fresno (*Dipodomys nitratooides exilis*), Tipton (*D. n. nitratooides*), and short-nosed (*D. n. brevinasus*) kangaroo rats (Best 1991). The Fresno and Tipton kangaroo rats are listed as Endangered at the Federal and State levels (U.S. Fish and Wildlife Service 1985, 1987; California Department of Fish and Game 1980, 1989), and the listing of the short-nosed kangaroo rat is now being considered.

A small population of Fresno kangaroo rats is present at Lemoore Naval Air Station (NAS) in the San Joaquin Valley (Morrison et al. 1996). Coyotes (*Canis latrans*) are also present on base and are a potential predator on this population. Management of the kangaroo rat population could include control of coyote numbers. Therefore, it is important to determine the diet of coyotes at Lemoore NAS. Although the diets of coyotes have been extensively documented (Bekoff 1977), relatively few studies have been conducted in California (e.g., Ferrel et al. 1953, Smith 1990) and I know of only 1 conducted specifically in the San Joaquin Valley (Cypher et al. 1994).

I investigated the diet of coyotes at Lemoore NAS to determine (1) if coyotes at Lemoore NAS prey on Fresno kangaroo rats and (2) if coyote diets at Lemoore NAS change monthly.

METHODS

Lemoore Naval Air Station is located in Fresno and Kings Counties, approximately 13 km west of Lemoore, California. The majority of land surrounding the base has been developed extensively for agriculture. Agricultural lands (5800 ha) are also present on base surrounding the air operations area. Cotton (*Gossypium*), tomatoes (*Lycopersicon*), and safflower (*Carthamus*) are the main crops grown.

Fresno kangaroo rats at Lemoore NAS are limited to a 40 ha area restricted from agricultural use but which is surrounded by agricultural land. A motor-cross track consisting of several dirt tracks of various widths transverses the site. Kangaroo rat burrows are common along the edges of this track (Morrison et al. 1996).

Coyote diets were evaluated by identifying the contents of coyote scats collected at the kangaroo rat area from July 1992 through January 1993. Two sections of the motor-cross track were walked about every 7-14 days and all scats present were collected. Scats found incidentally on other portions of the motor-cross track were included in the overall analysis of coyote diets but were excluded from the month by month analysis, as I could not reliably assign them a date of deposition.

Scats were enclosed in fine-mesh nylon bags, soaked at least 24 hours in a mild detergent, then rinsed thoroughly in warm water. Residual material was air-dried, separated by hand, and prey items were identified by comparison with a reference collection from the Museum of Wildlife and Fisheries Biology, University of California, Davis. Coyote diets were calculated as percent frequency of occurrence of prey items among scats during each month. Deer mice (*Peromyscus maniculatus*) and western harvest mice (*Reithrodontomys megalotis*) were classified as 1 prey item because their remains could not be distinguished reliably. Vegetation was classified

into 2 categories: the fruit category consisted of remains (seeds, skin, peel) that could be identified as originating from tomatoes, cantaloupe (*Cucurbitaceae*), or other fruit crop; and the seed category consisted of grass or weed seeds.

RESULTS

Cricetine rodents (deer mice and western harvest mice) were the most frequent prey item in coyote scats overall as well as all months with the exception of July (Table 1). Insects, California voles (*Microtus californicus*), and lagomorphs (*Lepus californicus* and *Sylvilagus bachmani*) occurrence varied monthly but occurred in >10% of all scats. Animal prey items that occurred in a lower percentages of scats included unidentified birds, California ground squirrels (*Spermophilus beecheyi*), gophers (*Thomomys* spp.), and amphibians/reptiles. Domestic cat (*Felis catus*) and house mouse (*Mus musculus*) remains were found in less than 2% of all scat. Kangaroo rats were not found in any of the scats.

The 2 categories of vegetation, seeds and fruit, both occurred in >50% of scat. Percent frequency of occurrence for these categories varied by month and was highest during the summer months of July, August, and September (Table 1).

DISCUSSION

The diet of coyotes at Lemoore Naval Air Station was made up of a variety of foods whose frequency of occurrence varied monthly. This is not surprising as coyotes are known to be opportunistic predators (Bekoff

1977). Cricetine rodents were the most frequently occurring prey item during most months. California voles and lagomorphs were the next 2 most frequent prey items. This is similar to the results of Ferrel et al. (1942), who found the staple food of coyotes in California to be rodents. However, in their study, voles were the most frequently occurring rodent followed by cricetines. Lagomorphs were the next most frequently occurring prey item in their study and the most frequently occurring prey item in coyote stomachs collected at the Naval Petroleum Reserve in the southern San Joaquin Valley (Cypher et al. 1994).

Insects were found in over 44% of the scats collected at Lemoore, with percent frequency of occurrence being highest in July. Others have documented insects in coyote diets during times of high insect abundance (Ferrel et al. 1942, Cypher et al. 1994). I did not collect data on insect abundance but it is likely that insect abundance was higher during these months due to the presence of ripening fruit crops such as tomatoes.

The overall frequency of occurrence of fruit in coyote scats at Lemoore was higher than other studies within the state (Ferrel et al. 1942, Cypher et al. 1994). Fruit consumption at Lemoore was highest during summer and early fall. Tomatoes are grown on base and cantaloupe in adjacent areas, and both crops become mature during these months. Others have found a seasonal shift in fruit consumption. Smith (1990) showed the diet of coyotes shifted predominately to manzanita berries in the fall and Fitcher et al. (1955) noted an increase in the utilization of fruit by coyotes in Nebraska during the fall.

Table 1. Percent frequency of occurrence of prey items identified in coyote scats collected at Lemoore NAS, California, July 1992 - January 1993. Prey that occurred in 2% or less of scats overall are not shown.

Item	Jul (11)	Aug (16)	Sept (16)	Oct (23)	Nov (6)	Dec-Jan (8)	Overall ¹ (93)
Seeds	90.1	56.3	81.3	39.1	33.3	12.5	54.8
Fruit	90.1	43.8	68.8	52.2	33.3	12.5	56.9
Insects	63.6	43.8	75.0	43.5	16.7	12.5	44.1
California voles	18.2	6.3	6.3	17.4	0.0	0.0	12.9
Lagomorphs	9.0	12.5	6.3	13.0	0.0	0.0	10.8
Cricetine rodents	0.0	81.3	75.0	52.2	100.0	100.0	62.4
Birds	9.0	0.0	0.0	4.3	0.0	0.0	5.4
Calif. ground squirrels	0.0	6.3	12.5	4.3	0.0	0.0	4.3
Gophers	0.0	0.0	0.0	0.0	0.0	12.5	2.2
Amphibians/reptiles	0.0	0.0	0.0	8.7	0.0	0.0	2.2

¹Includes 13 scats whose month of deposition was unknown.

Kangaroo rats were not found in scats collected during my study. Fresno kangaroo rats generally breed from December through August (Best 1991). Logistical constraints prevented me from collecting data during this time interval. It is possible that coyote predation at Lemoore predominated during this time. However, Cypher et al. (1994) found that although coyotes at the Naval Petroleum Reserve did prey on kangaroo rats as a group, predation on the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*) was extremely infrequent. Thus it appears that Fresno kangaroo rats are not a frequent prey item of coyotes at Lemoore Naval Air Station.

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